c. EXPERIMENT ON THE METHODS OF FERTILIZER APPLICATION UNDER DIFFERENT TEMPERATURES

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It is known that yield of rice differs according to the method of fertilizer application, while the effects of different fertilizing methods may differ according to temperatures. Experiments were carried out in order to look into this respect.

First year experiment

The experiment was made with a Ponlai variety (Taichung no. 65) in two greenhouses, one keeping higher temperatures than the other. Fertilizer treatments were 1) basic application by deep placement, 2) basic application (before transplanting) by surface placement, 3) basic application and top-dressing, 4) basic application of fertilizer ball, 5) basic application of soybean cake and 6) no fertilizer. The rates N, P_2O_5 and K_2O were 1.0 0.8 and 0.6 g per plot, respectively. Rice plents were taken at the intervals of 25 days for C/N determination. The results are showen in the Table 1.

Table 1. Effects of fertilizer-application method on agronomic characters of rice under a high and a low temperatures (1959)

Unit: g/pot

Crop	Temperature	High Temperature						Low Temperature					
	Treatment	I	II	III	IV	V	VI	I	II	III	IV	V	VI
1st crop	Date of heading	25/6	1/7	29/6	26/6	26/6	7/6	28/6	3/7	27/6	27/6	29/7	16/6
	Straw yield	71.2	71.7	76.8	81.8	73.7	40.8	48.8	52.8	46.8	50.6	47.5	—
	Grain yield	5.9	4.2	5.3	8.2	8.0	6.7	23.4	22.2	12.8	23.3	34.1	—
	Sterile grain	2.3	2.7	1.7	1.0	2.0	0.8	1.1	1.1	3.2	0.9	0.5	—
2nd crop	Date of heading	4/11	2/11	30/10	3/11	4/11	13/10	7/11	8/11	4/11	3/11	7/11	25/10
	Straw yield	46.8	42.1	47.5	50.6	52.5	33.0	57.8	53.1	43.8	50.0	50.8	37.5
	Grain yield	26.2	27.8	28.6	37.0	28.9	26.4	24.4	24.3	14.4	22.0	23.9	19.0
	Sterile grain	2.1	2.2	1.9	2.1	2.9	1.2	2.8	2.4	2.8	2.4	2.9	1.4

Note: *I. Basic application by deep placement
II. Basic application by surface placement
III. Basic application by top-dressing
IV. Ball fertilizer as base manure
V. Soybean cake as base manure
VI. No nitrogen
** Grain yield represented by the average for 4 replications

Table 2. Effect of temperatures on C/N ratio (1959)

		First crop			Second crop		
		Sampling date	High temp.	Low temp.	Sampling date	High temp.	Low temp.
1st	C	20/4	35.840	36.910	12/9	37.420	37.560
	N		2.979	3.411		3.549	3.306
	C/N		12.3	10.9		10.6	11.5
2nd	C	15/5	40.300	38.070	17/10	39.970	39.560
	N		2.880	3.123		2.597	2.642
	C/N		14.2	12.6		16.18	16.0
3rd	C	9/6	43.100	43.560	11/11	40.380	42.500
	N		1.930	1.910		1.761	1.810
	C/N		22.6	23.0		23.5	24.2
4th	C	4/7	40.550	41.040	4/12	41.290	40.600
	N		1.332	1.336		1.504	1.543
	C/N		31.0	30.87		27.8	26.8
5th	C	29/7	40.240	40.470	18/12	40.850	40.420
	N		1.155	1.074		1.277	1.411
	C/N		34.9	38.0		32.4	28.9

From the results shown in the above tables, it may be said that:

1. The low temperature plot gave higher grain yield than the high temperature plot in the first crop, but in the second crop this relation was reversed.
2. Straw yield was higher in the high temperature plot than in the low temperature plot in the first crop, and in the second crop no significant difference was found.
3. The differences among fertilizer treatments were not significant.
4. C/N ratio increase with the growth, but was little affected by other factors.

Second year experiment

Two varieties, two kinds of fertilizer (organic manure and chemical fertilizer), two different rates (1 g and 2 g per plot) of nitrogen and two temperature plots were examined in an experiment of factorial design with four replications. The rates of P_2O_5 and K_2O were evenly 0.8 g and 0.6 g per plot, respectively. Rice plants were taken at the interval of 25 days for C/N ratio determination. The results are shown in Table 3.

Table 3. Effects of fertilizer application methods on agronomic characters of rice under different temperature (1960)

Unit: g/pot

Crop	Character	Ponlai Variety (Taichung No. 65)							
		High temperature				Low temperature			
		I	II	III	IV	I	II	III	IV
1st crop	Date of heading	22/6	22/6	29/6	24/6	24/6	26/6	4/7	30/6
	Straw yield	63.9	74.1	88.0	74.2	46.6	48.8	81.1	65.7
	Grain yield	24.0	26.3	34.7	28.4	24.0	26.6	35.3	35.7
	Sterile grain	1.0	2.0	3.0	1.7	0.3	0.6	4.1	1.7
2nd crop	Date of heading	24/10	22/10	3/11	24/10	22/10	22/10	28/10	30/10
	Straw yield	50.0	45.0	69.3	81.3	40.0	35.0	65.6	55.6
	Grain yield	10.1	10.9	4.9	7.2	4.5	3.6	5.1	5.6
	Sterile grain	3.9	2.9	4.5	5.0	2.3	2.4	4.8	3.6
Crop	Character	Native Variety (Pai-mi-fun)							
		High temperature				Low temperature			
		I	11	III	IV	I	II	III	IV
1st crop	Date of heading	11/6	11/6	12/6	13/6	13/6	13/6	14/6	13/6
	Straw yield	44.5	39.6	80.4	69.7	39.8	40.5	68.1	59.1
	Grain yield	28.4	21.0	54.1	44.6	30.6	27.5	48.7	42.2
	Sterile grain	1.4	1.3	2.8	1.4	1.9	1.4	2.3	1.2
2nd crop	Date of heading	23/10	24/10	28/10	30/10	24/10	25/10	28/10	25/10
	Straw yield	61.7	55.3	71.8	69.0	41.7	40.6	73.4	57.6
	Grain yield	28.7	22.4	31.6	31.5	20.0	19.8	32.2	22.1
	Sterile grain	4.5	2.0	3.8	4.8	1.6	1.6	4.6	3.6

Note: I. 2g of N with organic manure
II. 1g of N with organic manure
III. 2g of N with chemical fertilizer
IV. 1g of N with chemical fertilizer

Table 4. Effect of temperature on C/N ratio of plant (1960)

Crop			1st crop			
Temperature			High temp.		Low temp.	
Varity			Ponlai	Native	Ponlai	Native
1st	5/4	C	35.67	34.72	36.06	36.51
		N	2.10	1.99	2.17	1.95
		C/N	17.00	17.40	16.60	18.70
2nd	30/4	C	39.87	37.57	37.45	36.06
		N	1.96	1.84	1.69	1.70
		C/N	20.30	20.40	22.20	21.20
3rd	25/5	C	34.95	35.72	36.73	1.36
		N	1.25	1.22	1.56	1.36
		C/N	28.00	29.30	23.50	26.60
4th	19/6	C	28.25	37.61	37.65	38.25
		N	1.19	1.10	1.24	1.15
		C/N	32.10	34.20	30.40	33.50
5th	14/7	C	37.68	37.00	38.59	38.69
		N	0.98	0.88	0.90	0.89
		C/N	38.40	42.10	42.80	43.50

From the results in the above tables, it may be said that:

1. In the first crop no marked difference in grain yield arose between the high and low temperatures, though, in the second crop, the high temperature plot showed higher yield than the low temperature plot.
2. In the first crop, grain yield was higher in the plots of chemical fertilizers than in those of organic manures.
3. Straw yield in the high temperature plot was higher than that in the low temperature plot.
4. Straw yield in plots of chemical fertilizers was higher than those in organic manure plots.
5. C/N ratio increased with growth, but was little affected by other factors.

Note on the third year experiment:

The third year experiment will be made similarly as in the second year.

DISCUSSION

Yen: The grain yields in treatment III in the low temperature plot shown in Table 1 are markedly low in both the first and second crops. I wonder why?

Lee: We have no good explanation for this. Perphaps it is due to error.

Hsu: Soybean cake was the only organic nitrogen used in this experiment. It seems necessary to test other kind of organic manures, and to evaluate the effects in relation with the rate of decomposition.

Ku: In the first year, the high temperature plot showed a low grain yield especially in the first crop, but did not in the second year experiment, How is your explanation for this?

Lee: In the first year the high temperature reached so high that the pollination might be affected but in the second year regulation was made to avoid such a failure.

Yen: Please explain the reason for the low yield in the second crop of Ponlai variety in the second year.

Lee: The temperature became too low after the heading stage.

Hsu: Statistical analysis should be conducted.

Lee: Yes, we are doing it now.

Hsu: Temperature of soil layer should be investigated.